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10/757,954	01/15/2004	Robert Bruce Grant	M03B330	5080

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EXAMINER
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VATHYAM, SUREKHA

ART UNIT	PAPER NUMBER
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1753

MAIL DATE	DELIVERY MODE
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09/04/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

Application No.

10/757,954

Applicant(s)

GRANT ET AL.

Examiner

Surekha Vathyam

Art Unit

1753

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 05 July 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 January 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>6/23/05</u>   | 6) <input type="checkbox"/> Other: _____                          |

## DETAILED ACTION

### *Drawings*

1. The drawings are objected to because the thickness of the lines in figs. 1 and 2 depicting the measurement electrode (14), reference electrode (16) and additional working electrode (36) each are insufficient to distinguish them from the electrolyte (12) over which they are drawn. Hence it appears reference characters 12, 14, 16 and 36 are all pointing to the same structure in these figures. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Claim Objections***

2. Claim 14 is objected to because of the following informalities: in line 15 of claim 14, "is" should be changed to - -with- -. Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 6 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. Regarding claim 6, the phrases "typically" and "such as" render the claim indefinite because it is unclear whether the limitations following these phrases are part of the claimed invention. See MPEP § 2173.05(d).

6. Claims 7 – 10 and 16 – 19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In claim 7, it is unclear what is meant by the limitation, "means for controlling the oxygen electrochemical semi-permeability of the cell so as to control the sensitivity of the sensor to the introduction of the organic contaminant molecules". In claim 8, it is unclear what is meant by the limitation, "means for controlling the rate of flux of oxygen anions flowing between the additional electrode

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and the measurement electrode". Claim 9 depends from claim 8 and claim 10 depends from claim 7. In claim 16, it is unclear what is meant by the limitation, "controlling the oxygen electrochemical semi-permeability of the cell so as to control the sensitivity of the sensor to the introduction of the organic contaminant molecules". In claim 17, it is unclear what is meant by the limitation, "controlling the rate of flux of oxygen anions flowing between the additional electrode and the measurement electrode". Claims 18 and 19 depend from claim 17.

### ***Claim Rejections - 35 USC § 102***

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1 – 2 and 4 – 5 are rejected under 35 U.S.C. 102(b) as being anticipated by Kitanoya et al. (US 2003/0062264). Ueno et al. (US 5,889,196) is used as evidence that Pt electrodes

Regarding claim 1, Kitanoya ('264) discloses an organic contaminant molecule sensor (see figs. 3 and 4 and [0041] – [0042]) comprising: an electrochemical cell (10) having a solid state oxygen anion conductor (30) ([0032]), a measurement electrode (40) formed on a first surface of the conductor for exposure to a monitored environment ([0033]), and a reference electrode (20) formed on a second surface of the conductor

for exposure to a reference environment ([0031]), the electrodes comprising material for catalysing the dissociative absorption of oxygen ([0031], [0033]); and means (80, 21, 41) for monitoring the potential difference between the electrodes ([0037]), so that, in the absence of organic contaminant molecules in the monitored environment, the potential difference between the electrodes assumes a base value  $V_b$  and, upon the introduction of organic contaminant molecules into the monitored environment, the potential difference assumes a measurement value  $V_m$  due to the reaction of the organic contaminant molecules with oxygen in the monitored environment,  $V_m - V_b$  being indicative of the amount of organic contaminant molecules introduced into the monitored environment (see fig. 3 wherein monitoring potential difference in absence and presence of organic contaminants is shown).

Regarding claim 2, Kitanoya ('264) discloses the sensor comprising means (70) for controlling the temperature of the cell ([0036]).

Regarding claim 4, Kitanoya ('264) discloses the sensor wherein the material for catalysing the dissociative absorption of oxygen is platinum ([0033]).

Regarding claim 5, Kitanoya ('264) discloses the sensor wherein the solid state oxygen anion conductor is selected from the group of materials comprising gadolinium doped ceria and yttria stabilised zirconia ([0040]).

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9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

11. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

12. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kitanoya et al. (US 2003/0062264) in view of Aagard et al. (US 5,389,225).

Kitanoya ('264) discloses the sensor as discussed with regards to claim 2 above. Regarding claim 3, Kitanoya ('264) discloses the sensor wherein the control means comprises a heater (60) ([0035]). Kitanoya ('264) also discloses controlling the temperature on the basis of measuring internal resistance between the measurement electrode and reference electrode ([0036]). Kitanoya ('264) does not explicitly disclose a thermocouple arrangement.

Aagard ('225) teaches a sensor (10) comprising: an electrochemical cell having a solid state oxygen anion conductor (14), a measurement electrode (15, 16) formed on a first surface of the conductor for exposure to a monitored environment, and a reference electrode (15, 16) formed on a second surface of the conductor for exposure to a reference environment (see fig. 2), the electrodes comprising material for catalysing the dissociative absorption of oxygen (column 7, line 67 – column 8, line 3); and means (23) for monitoring the potential difference between the electrodes (column 9, line 60 – column 10, line 4). Aagard ('225) also teaches the sensor comprising means (13) for controlling the temperature of the cell (column 7, lines 49 – 64) further comprising a heater (13) and a thermocouple arrangement (column 10, lines 4 – 13).

It would have been obvious to one of ordinary skill in the art to have substituted the thermocouple arrangement taught by Aagard ('225) for the internal resistance measurement device in the sensor of Kitanoya ('264) because as Aagard ('225) explains the thermocouples are able to measure and determine temperature differentials typically between about 20 °C and about 200 °C at sensor absolute operating temperatures of about 300 °C to 900 °C (column 10, lines 7 – 13).



13. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kitanoya et al. (US 2003/0062264) in view of Sahimi et al. (US 2005/0016848).

Kitanoya ('264) discloses the sensor as discussed with regards to claim 1 above. Regarding claim 6, Kitanoya ('264) does not explicitly disclose the reference oxygen environment is a solid-state source of oxygen.

Sahimi ('848) teaches a sensor (see figs. 1 and 2) comprising: an electrochemical cell having a solid state oxygen anion conductor (10) ([0023]), a measurement electrode (30) formed on a first surface of the conductor for exposure to a monitored environment, and a reference electrode (40) formed on a second surface of the conductor for exposure to a reference environment, the electrodes comprising material for catalysing the dissociative absorption of oxygen ([0024]). Sahimi ('848) further discloses the reference oxygen environment is a solid-state source of oxygen (20) selected from the group consisting of a metal/metal oxide couple, Cu/Cu<sub>2</sub>O, Pd/PdO, a metal oxide/metal oxide couple and Cu<sub>2</sub>O/CuO ([0025] and [0049]).

It would have been obvious to one of ordinary skill in the art to have used a solid-state source of oxygen for the reference environment of Kitanoya ('264) as taught by Sahimi ('848) because Sahimi ('848) explains the oxygen occluding and releasing function of a solid oxygen reference gas can occur over a long period of time at high temperatures without being contaminated by such elements as Si, Ca, P, C, and the like ([0021]).

14. Claims 7 – 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kitanoya et al. (US 2003/0062264) in view of Gao et al. (US 6,551,497).

Kitanoya ('264) discloses the sensor as discussed with regards to claim 1 above. Regarding claims 7 – 10, Kitanoya ('264) does not explicitly disclose a means for controlling the oxygen electrochemical semi-permeability of the cell.

Gao ('497) teaches a sensor comprising: an electrochemical cell having a solid state oxygen anion conductor (31), a measurement electrode (32) formed on a first surface of the conductor for exposure to a monitored environment (38), and a reference electrode (33) formed on a second surface of the conductor for exposure to a reference environment (39) (see figs. 1 and 2), the electrodes comprising material for catalysing the dissociative absorption of oxygen (column 4, lines 40 – 49 and column 7, lines 47 – 51). Gao ('497) teaches a means for controlling the oxygen electrochemical semi-permeability of the cell so as to control the sensitivity of the sensor to the introduction of contaminant molecules (figs. 1 and 2 and column 4, line 40 – column 5, line 34) comprising an additional electrode (34) in the reference environment (39), means for controlling the rate of flux of oxygen anions flowing between the additional electrode and the measurement electrode (column 5, lines 12 – 27), means for controlling the electrical current (35) flowing between the additional electrode and the measurement electrode (column 4, lines 52 – 59) and means for controlling the concentration of

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oxygen within the reference environment (column 3, lines 20 – 44 and column 7, lines 20 – 33).

It would have been obvious to one of ordinary skill in the art to include the means for controlling the oxygen electrochemical semi-permeability of the cell as taught by Gao ('497) in the sensor of Kitanoya ('264) because Gao ('497) explains that it has the benefit of providing much larger output than prior art detection methodologies (column 5, lines 27 – 36).

Regarding claims 11 and 12, Kitanoya ('264) does not explicitly disclose means for controlling the amount of oxygen within the monitored environment.

Gao ('497) teaches a sensor comprising means for controlling the amount of oxygen within the monitored environment (column 3, lines 20 – 44 and column 7, lines 20 – 33), which enables controlling the pressure within the monitored environment.

It would have been obvious to one of ordinary skill in the art to have included the means for controlling the amount of oxygen within the monitored environment as taught by Gao ('497) in the sensor of Kitanoya ('264) because Gao ('497) explains it enables accurate detection of contaminant molecule in the monitored environment without fluctuations in the oxygen concentration (column 7, lines 10 – 33).

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15. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kitanoya et al. (US 2003/0062264) in view of Gao et al. (US 6,551,497) as applied to claim 11 above, and further in view of Joshi et al. (US 6,051,123).

Regarding claim 13, Kitanoya ('264) discloses the sensor further comprising means for drawing a flow of gas into the monitored environment ([0043]). Kitanoya ('264) does not explicitly disclose means for extracting oxygen from gas being drawn into the monitored environment.

Joshi ('123) teaches a sensor comprising means for extracting oxygen from gas being drawn into the monitored environment (see figs. 22 and 23 and column 3, lines 14 – 58, column 15, lines 7 – 18, column 15, lines 38 – 41 and column 16, lines 29 – 37).

It would have been obvious to one of ordinary skill in the art to have included the means for extracting oxygen from gas being drawn into the monitored environment as taught by Joshi ('123) in the sensor of Kitanoya ('264) because Joshi ('123) explains concentration of oxygen in a sample to be measured could be as high as 15% impeding the low level detection of the contaminant of interest in the sample. Therefore, oxygen removal means will enable the enhanced detection of the contaminant (column 14, lines 18 – 36).

16. Claims 14 – 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kitanoya et al. (US 2003/0062264) in view of Ueno et al. (US 5,889,196).

Regarding claim 14, Kitanoya ('264) discloses a method of monitoring the amount of organic contaminant introduced into a monitored environment ([0041] – [0043]) comprising: (a) providing an electrochemical cell (10) ([0042]) having a solid state oxygen anion conductor (30) ([0032]), a measurement electrode (40) formed on a first surface of the conductor for exposure to the monitored environment ([0033]), and a reference electrode (20) formed on a second surface of the conductor for exposure to a reference environment ([0031]), the electrodes comprising material for catalysing the dissociative absorption of oxygen ([0031], [0033]); and (b)(1) monitoring the potential difference between the electrodes in the absence of organic contaminant molecules in the monitored environment (see fig. 3 at the point where “concentration of gas to be detected” on the x-axis is 0 ppm, ppmC), and (b)(2) monitoring the potential difference between the electrodes upon the introduction of organic contaminant molecules into the monitored environment (see fig. 3); so that the difference between (I) the potential difference between the electrodes upon the introduction of organic contaminant molecules and (II) the potential difference between the electrodes in the absence of organic contaminant molecules is a function of the amount of organic contaminant molecules introduced into the monitored environment (see fig. 3 wherein monitoring potential difference in absence and presence of organic contaminants is shown).

Kitanoya ('264) does not expressly explain the well-known chemistry that causes the potential difference in the presence of the organic contaminant molecules to be a function of the reaction of the organic contaminant molecules with the oxygen in the monitored environment.

Ueno ('196) teaches a method of monitoring the amount of organic contaminant introduced into a monitored environment (column 3, line 62 – column 4, line 9) comprising: providing an electrochemical cell (1) having a solid state oxygen anion conductor (2), a measurement electrode (3, 4) formed on a first surface of the conductor for exposure to the monitored environment, and a reference electrode (5) formed on a second surface of the conductor for exposure to a reference environment, the electrodes comprising material for catalysing the dissociative absorption of oxygen (column 3, line 62 – column 4, line 6). Ueno ('196) further explains the chemistry that helps monitor the amount of the organic contaminant molecules as a function of the reaction of the organic contaminant molecules with the oxygen in the monitored environment (column 5, line 62 – column 6, line 15).

It would have been obvious to one of ordinary skill in the art to have looked at the prior art such as the teachings of Ueno ('196) to explain the chemistry that occurs in monitoring the amount of organic contaminants in the gas sensor of Kitanoya ('264) having an electrode comprising a material for catalysing the dissociative absorption of oxygen because Kitanoya ('264) does not explain the details of how this chemistry occurs.

Regarding claim 15, Kitanoya ('264) discloses the method further comprising the step of controlling the temperature of the cell ([0036]).

17. Claims 16 – 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kitanoya et al. (US 2003/0062264) in view of Ueno et al. (US 5,889,196) as applied to claim 14 above, and further in view of Gao et al. (US 6,551,497).

Regarding claims 16 – 19, Kitanoya ('264) in view of Ueno ('196) does not explicitly disclose the step of controlling the oxygen electrochemical semi-permeability of the cell so as to control the sensitivity of the sensor to the introduction of the organic contaminant molecules.

Gao ('497) discloses a method of monitoring the amount of a contaminant introduced into a monitored environment (column 1, lines 10 – 15) comprising: (a) providing an electrochemical cell having a solid state oxygen anion conductor (31), a measurement electrode (32) formed on a first surface of the conductor for exposure to the monitored environment (38), and a reference electrode (33) formed on a second surface of the conductor for exposure to a reference environment (39), the electrodes comprising material for catalysing the dissociative absorption of oxygen (column 4, lines 40 – 49 and column 7, lines 47 – 51); and monitoring the potential difference between the electrodes in the presence of contaminant molecules in the monitored environment, which is a function of the amount of contaminant molecules introduced into the monitored environment (column 4, lines 52 – 56). Gao ('497) also teaches the step of controlling the oxygen electrochemical semi-permeability of the cell so as to control the sensitivity of the sensor to the introduction of the contaminant molecules (figs. 1 and 2 and column 4, line 40 – column 5, line 34) wherein the oxygen electrochemical semi-permeability of the cell is controlled by controlling the rate of flux of oxygen anions

flowing between the measurement electrode (32) and an additional electrode (34) in the reference environment (39) (column 5, lines 12 – 27) which is further controlled by controlling the electrical current flowing between the measurement electrode and the additional electrode (column 4, lines 52 – 67).

It would have been obvious to one of ordinary skill in the art to have included the step of controlling the oxygen electrochemical semi-permeability of the as taught by Gao ('497) in the method of Kitanoya ('264) because Gao ('497) explains that it has the benefit of providing much larger output than prior art detection methodologies (column 5, lines 27 – 36).

Regarding claim 20, Kitanoya ('264) does not explicitly disclose the step of controlling the amount of oxygen within the monitored environment.

Gao ('497) teaches a method of monitoring the amount of contaminant in a monitored environment comprising the step of controlling the amount of oxygen within the monitored environment (column 3, lines 20 – 44 and column 7, lines 20 – 33).

It would have been obvious to one of ordinary skill in the art to have included the step of controlling the amount of oxygen within the monitored environment as taught by Gao ('497) in the method of Kitanoya ('264) because Gao ('497) explains it enables accurate detection of contaminant molecule in the monitored environment without fluctuations in the oxygen concentration (column 7, lines 10 – 33).



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**Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Surekha Vathyam whose telephone number is 571-272-2682. The examiner can normally be reached on 7:30 AM to 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/SV/  
27 August 2007

  
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